AMENDMENTS TO THE CLAIMS

1. (AMENDED) A message passing fabric modular processor system comprising:

a plurality of processing elements, each element in data communication with ~~accessing~~ a set of available processing elements;

a plurality of message ports associated with and in communication with each processing element, each pair of message ports on adjacent processing elements defining a potential message path therebetween;

said potential message path therebetween each pair of message ports on adjacent processing elements along with control information comprising potential route segments;

addressing means associated with each processing element for indicating the destination processing element of a message in the fabric;

said addressing means allowing the message to contain data only;

said message to move across the fabric unaltered from source processing element to destination processing element;

prioritization means associated with each processing element and with each message port for determining which message port is to be given access to the associated processing element or message port for the purpose of communication therewith;

starting from the origin processing element and proceeding to the destination processing element via intermediate processing element message ports said prioritization means establishes a completed path from an origin processing element to a destination processing element;

said prioritization means establishes said completed path from an origin processing element to a destination processing element starting with the optimal route segments and then exhaustively attempting each possible route segment combination in order to establish said completed path;

said completed path allowing control information to pass along same said completed path in both directions between origin processing element and destination processing element;

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said control information providing means for the destination processing element to signal the origin processing element that a message delivery failure has occurred and for the origin processing element to resend the message;

said control information providing means for the destination processing element to signal the origin processing element that a message has been received and will be acted upon;

said control information providing means for releasing all message route segments for use by other messages after a message received signal has been sent from the destination processing element to the origin processing element;

said prioritization means along with said control information allowing messages to be processed without the need for an additional message queue;

wherein the fabric asynchronously establishes routes for synchronous messages from an origin processing element to a destination processing element according to the prioritization to permit an operation to occur at the destination processing element.

10. (AMENDED) The message passing fabric modular processing ~~processor~~ system of claim 1 wherein the length of each message path segment is one processing unit interconnection in one dimension of the fabric.

17. (AMENDED) The message passing fabric modular processor system of claim 1 wherein message collisions are detected, and contending processing elements are independent ~~of the other~~ in the time domains in which each of them retries messaging independent of the other.

18. (AMENDED) The message passing fabric modular processor system of claim 12 wherein the path to an alternative next-shortest destination address may be orthogonal to the path to the destination address ~~addressing means provides a means for any particular path segment to be non-optimal~~ if the absolute time-to-live value is positive ~~and all optimal routes have been exhausted~~.

20. CANCELLED.

21. (NEW) A method for message passing in a modular processor system comprising the steps of:

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performing computational operations using a plurality of processing elements, each element in data communication with a set of available processing elements;

performing data communication via a plurality of message ports associated with and in communication with each processing element, each pair of message ports on adjacent processing elements defining a potential message path therebetween;

said potential message path therebetween each pair of message ports on adjacent processing elements along with control information comprising potential route segments;

communicating by using an addressing means associated with each processing element for indicating the destination processing element of a message in the fabric;

said addressing means allowing the message to contain data only;

said message to move across the fabric of the modular processing system unaltered from source processing element to destination processing element;

communicating by using a prioritization means associated with each processing element and with each message port for determining which message port is to be given access to the associated processing element or message port for the purpose of communication therewith;

starting from the origin processing element and proceeding to the destination processing element via intermediate processing element message ports said prioritization means establishes a completed path from an origin processing element to a destination processing element;

said prioritization means establishes said completed path from an origin processing element to a destination processing element starting with the optimal route segments and then exhaustively attempting each possible route segment combination in order to establish said completed path;

said completed path allowing control information to pass along same said completed path in both directions between origin processing element and destination processing element;

said control information providing means for the destination processing element to signal the origin processing element that a message delivery failure has occurred and for the origin processing element to resend the message;

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said control information providing means for the destination processing element to signal the origin processing element that a message has been received and will be acted upon;

said control information providing means for releasing all message route segments for use by other messages after a message received signal has been sent from the destination processing element to the origin processing element;

said prioritization means along with said control information allowing messages to be processed without the need for an additional message queue;

wherein the modular processing system asynchronously establishes routes for synchronous messages from an origin processing element to a destination processing element according to the prioritization to permit an operation to occur at the destination processing element.

22. (NEW) – The message passing fabric modular processor system of claim 20 wherein the processing elements are selected from a set of central processing units, arithmetic logic units, memory elements, arbitrary function generators, state machines, digital signal processors, analog signal processors, programmable logic devices, field programmable gate arrays, complex programmable logic devices, input elements, output elements, and general purpose logic elements.

23. (NEW) – The message passing fabric modular processor system of claim 22 wherein the fabric is comprised of heterogeneous processing elements.

24. (NEW) - The message passing fabric modular processor system of claim 22 wherein the fabric is comprised of multiple sets of heterogeneous processing elements.

25. (NEW) - The message passing fabric modular processor system of claim 24 wherein the type of processing elements is selected based upon the computational characteristics of a predetermined computational task to be performed by the system.

26. (NEW) - The message passing fabric modular processor system of claim 25 wherein the proportions of processing element types are selected based upon the computational characteristics of a predetermined computational task to be performed by the system.

27. (NEW) - The message passing fabric modular processor system of claim 24 wherein the spatial arrangement of processing elements is selected based upon the computational characteristics of a predetermined computational task to be performed by the system.

28. (NEW) - The message passing fabric modular processor system of claim 26 wherein the spatial arrangement of processing elements is selected based upon the computational characteristics of a predetermined computational task to be performed by the system.

29. (NEW) - The message passing fabric modular processor system of claim 24 wherein the type, proportion, and spatial arrangement of processing elements are selected to increase the availability of processing elements under conditions of high utilization of processing elements.

30. (NEW) - The message passing fabric modular processor system of claim 21 wherein the length of each message path segment is one processing unit interconnection in one dimension of the fabric.

31. (NEW) - The message passing fabric modular processor system of claim 26 wherein the addressing means decodes the address of the message destination and determines the shortest next destination within the fabric.

32. (NEW) - The message passing fabric modular processor system of claim 30 wherein the addressing means selects an alternative next-shortest destination address if the prior determined address is unavailable.

33. (NEW) - The message passing fabric modular processor system of claim 27 wherein the set of available processing elements of each processing element in the fabric is stored in a modifiable data structure.

34. (NEW) - The message passing fabric modular processor system of claim 33 wherein the data contained in each modifiable data structure is modified based upon the computational characteristics of a predetermined computational task to be performed by the system.

35. (NEW) - The message passing fabric modular processor system of claim 21 wherein the prioritization means comprises means to prevent deadlock over access to processing elements or message paths.

36. (NEW) - The message passing fabric modular processor system of claim 21 wherein asynchronous establishment of routes for synchronous messaging from an origin processing element to a destination processing element requires no flow control protocol to be implemented in the route from the origin processing element to the destination processing element.

37. (NEW) - The message passing fabric modular processor system of claim 21 wherein message collisions are detected, and contending processing elements are independent of the other in the time domains in which each of them retries messaging.

38. (NEW) - The message passing fabric modular processor system of claim 32 wherein the addressing means provides a means for any particular path segment to be non-optimal if the absolute time-to-live value is positive and all optimal routes have been exhausted.

39. (NEW) - The message passing fabric modular processor system of claim 38 wherein upon selection of an orthogonal path causes the absolute value of a time-to-live register to be decremented.